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## JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

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# VOLCK OIL, SPECIAL EMULSION NUMBER TWO, AS AN ANIMAL INSECTICIDE*

*By*

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The efficiency of Volck oil as an insecticide and ovicide against certain insect pests led the manufacturers to believe that the material might prove to be effective against external insect parasites of man and animals. Accordingly, the problem of determining this efficiency was begun at the Kansas State Agricultural College, Department of Entomology, June 1, 1927, by Mr. W. G. Bruce**. This work was carried on through the administration of the Crop Protection Institute. The present paper is based upon the experiments carried on through the past winter as a continuation of this project.

## Material Used

The material used throughout this set of experiments was Volck Oil, Special Emulsion No. 2. This oil differs from other Volck oils in the type of emulsifying agent used.

The undiluted oil is white, has the consistency of heavy cream, is almost odorless, and has a slight acid taste. It goes into solution readily with hard or soft, cold or warm water. In solutions of high dilution, it separates very quickly. A five per cent emulsion will separate within a few days and emulsions of higher concentration will last somewhat longer.

## Effect of the Oil Upon Animals

Emulsions of this oil varying from 4.5 to 100 per cent have been used externally upon over 300 animals

*This paper is a thesis submitted in 1929 in partial fulfillment of the requirements for the degree of Master of Science in the Graduate School of the Kansas State Agricultural College. These studies have been carried out in connection with the project on insecticidal possibilities of Volck Oil, Special Emulsion No. 2, administered by the Crop Protection Institute, with funds supplied by the California Spray-Chemical Company.

**Bruce, W. G.
1928. The Use of Volck Against External Parasites of Domestic Animals.
Jour. Kans. Ent. Soc., 1:74-79.

without apparent signs of ill effects.

In every case treated, the oil gave a smooth, glossy coat of hair, a better skin texture, and a finer general apperance. Most highly refined petroleum oils have this effect upon skin and hair.

Volck oil taken internally in normal doses is practically harmless. Many pigs and hogs have been observed feeding on excess spray material, and none have shown ill effects. Large dosages of oil might cause a certain amount of damage to the animal.

A one-hundred-fifty pound hog was given a six-ounce dose of 100 per cent Volck by means of a stomach tube. The temperature of the animal had risen from 102 degrees to 103 degrees the following day. On the third day after the dose was given, the temperature of the animal had returned to normal. Outside of a slight laxative effect, the animal showed no external symptoms.

Four days after the first dose of Volck had been administered to the hog, a 12-ounce dose of 100 per cent oil was administered to the animal by stomach tube. Five hours later its temperature had risen to 105 degrees, returning to normal on the third day after the treatment. The animal again showed but slight external symptoms.

The hog was killed five days after the second treatment and post-mortem showed a severe gastritis of the stomach, which was due very probably to the action of the oil. The animal would have been able to throw off these ill effects.

**Effect of the Oil Upon External Insect Parasites**

The rapidity of the killing power of this oil is almost phenomenal. An insect to which it is applied usually dies within a relatively short period of time—30 minutes.

It has been advanced that oils such as this kill insects to which it is applied by stoppage of the spiracles, thereby causing suffocation. It is not probable that suffocation could kill an insect so rapidly as this oil usually does, and it is felt that some other mechanism or combination of mechanisms will be found to produce the result.

**Methods Used To Apply the Oil**

All but six applications of the oil were made by dipping or spraying. In most cases, the farm animals

and pet stock being treated were worked over until every part of their bodies was entirely covered with the oil.

A few large animals were sprayed with a five-gallon force pump sprayer. These animals were sprayed until the oil had penetrted to most parts of the body surface.

The majority of the animals treated were dipped into a large barrel or drum. The emulsion placed in this container was ample to allow a complete coverage to the animal being dipped.

### Demodectic Mange of the Dog (Demodex canis)

Three dogs upon which the mite **Demodex canis** had become pathological were treated with three dilutions of Volck oil. Only one of these cases was carried to completion, and that one is discussed below. The other two dogs were brought into the Veterinary Clinic for treatment by private owners, and after several applications of the oil had given no evident results for the betterment of the mange, the oil treatments were discontinued.

A seven months old Boston terrier bitch infected with **Demodex** was secured. The skin of this animal was very heavily infested with mites. About one-fourth the total surface area was denuded of hair and these bare spots were covered with skin lesions and pustules. The dog presented a well advanced case of demodectic or red mange of canines. Microscopic examination proved the mite to be present in abundance. The owner of the dog stated that the animal had been noticeably affected for several months previous to the first oil treatment.

Before each application of Volck, the dog was throughly washed with warm water and soap. The scabs were removed with a stiff bristled brush after they were sufficiently softened by the warm water. The pustules were opened and their contents were removed wherever this was possible. All the applications of oil were made at approximately body temperature and as much care as possible was taken to prevent the animal from chilling after the oil had been applied.

Four applications of 25 per cent Volck were made upon the dog, the first two applications being seven days apart; the final two being three days apart. These four treatments were followed by four applications of 100 per cent Volck, each treatment being three days apart.

Immediately following the first and second treat-

ments of the oil, a slight improvement was noticed in the conditions of the skin lesions and pustules. A few of those which were not extensive had the appearance of healing. This effect was lost in each case on about the third day. Thereafter, no results for the betterment of the case were secured.

Following the eight applications of straight Volck, a mixture of Volck and Derrisine powder was applied to the animal in two treatments, these being each three days apart. This material was in the proportion of one-fourth pound of the powder to one gallon of 90 per cent Volck. The combination was rubbed over the entire body of the dog. This combination did not give satisfactory results in the control of the mange and was seemingly toxic to the dog. She became extremely nervous, lacked appetite, was hardly able to stand, shook continually, and her eyes were mattered shut for several days at a time.

After four applications of 25 per cent Volck, four applications of 100 percent Volck and two applications of a mixture composed of one-fourth pound of Derrisine powder mixed into one gallon of 90 per cent Volck oil, the case was unimproved and was turned over to the Veterinary Clinic for proper disposal after microscopic examination had proved the mites to be still abundant.

Volck oil in the dilutions used showed no demonstrable beneficial effects upon this case of demodectic or red mange of the dog.

### The Common Dog and Cat Flea (Ctenocephalis spp.)

Four dogs and two cats moderately to heavily infested with the common fleas of the dog and cat were dipped in several dilutions of Volck. Each animal was held in the dipping solution for about ten minutes in order that the oil might be brought thoroughly in contact with the parasites.

A dog was dipped in a four per cent emulsion of Volck. This gave but a very incomplete kill of the fleas. Four fleas were removed from the animal after dipping and were kept under observation. Three of these recovered.

One dog and one cat were dipped in a five per cent emulsion of Volck, this resulting in a fair control of the fleas. Ten fleas were removed from the cat after it had been in the oil for three minutes and six of these recovered. Five fleas were removed from the dog after it had

been in the oil for five minutes and three recovered. A few fleas were found upon both animals when they were inspected 24 hours later.

Two dogs and one cat were dipped in a six per cent emulsion of Volck. This dilution of the oil resulted in a practical control of the fleas. One dog was inspected 24 hours after the application of the oil, and two live fleas were found upon it. Four fleas were found upon the other dog 24 hours after the application. No fleas were found upon the cat until three days after it had been dipped.

No apparent repellent effects are exhibited by the oil under the conditions in which it was used, and it is therefore difficult to draw conclusions upon its efficiency to rid an animal of fleas. The oil seems to be effective as an insecticide upon the flea only so long as it spreads to the fleas from the hair or reaches them directly when the host is dipped. Those fleas which return to the animal after the oil has become partially or wholly dry are probably not affected by it.

### The Biting Dog Louse
### (Trichodectes latus)

Two dogs infested with the biting dog louse were treated with Volck oil in five and seven per cent emulsions. Both dilutions gave a satisfactory control of the nymphal and adult lice upon the animals.

The dog which was dipped in a five per cent emulsion was found to be reinfested with nymphs a few days after the treatment. The animal was isolated from others, therefore indicating that this reinfestation came from eggs hatching upon its body. The dog was redipped in a five per cent emulsion upon the fifteenth day after the first application. These two applications of five per cent Volck oil applied 15 days apart resulted in a control of the louse infestation on this animal.

The dog which was dipped in a seven per cent Volck also became reinfested with nymphal lice but was not redipped. Twenty-six days after the single application of oil, the infestation had reached approximately 75 per cent of what it had been before the treatment of oil.

### The Biting Horse Louse
### (Trichodectes equi)

Volck oil in a six percent emulsion applied to one horse killed all the nymphal and adult lice upon the animal. A number of these were put in a container and

were kept under observation for a number of hours. None of these recovered. A few live lice were found upon the animal several hours after the application. None but dead lice were found the day following.

Eight days after the application, nymphs began to appear, these hatching from eggs upon the animal. When last seen 21 days after the single treatment, the horse was again infested with lice. The exact proportion of eggs that hatched upon the animal after the application of the oil cannot be stated. The subsequent infestation was not as heavy as the first, though lice could be found over most of the horse.

### The Hog Louse
### (Haematopinis suis)

Two-hundred-twenty shoats and hogs were divided into 14 experimental lots and were either dipped or sprayed with emulsions of Volck oil, the strength of which varied from four to twelve per cent. The results secured from these experiments are as follows:

Five small pigs were dipped and one sow was sprayed with a four per cent emulsion. Upon the following day it was found that the majority of the lice upon these animals were not affected by the oil at this strength.

Ten small pigs were dipped and two sows were sprayed with a five per cent emulsion. A number of live lice were found upon all of these animals the day following the application.

The 37 small pigs and the six sows which were dipped or sprayed with emulsions of seven, nine and twelve per cent showed no infestation of lice the day following the application of the oil.

An examination made the third day after the aplication of the oil showed the presence of a few lice upon all the sows which had been sprayed. It was decided that the spray had not been applied effectively. A further check taken nine days after the treatment showed that eggs were hatching on all the sows.

Because of the differences secured with the five and seven per cent emulsions, 49 pigs were dipped in six per cent Volck. Examinations during the following five days showed that Volck oil in a six per cent emulsion was as effective in the control of the adult hog louse as those emulsions of higher concentration.

Consequently, 15 days after the first application of

the oil, all the pigs which had been treated were again dipped or sprayed. In addition to these, 38 pigs were sprayed with a ten per cent emulsion.

Three days after this treatment, 47 of the smaller pigs were dead. Post-mortem examinations made by the Clinic Department of the Veterinary College showed lesions of cholera as well as some pneumonic symptoms. This mishap broke up the major part of the first set of experiments.

Fifty-five hogs were sprayed with Volck oil in dilutions which varied from five to twelve per cent. Unfavorable results were secured from these applications because of the inaccessible locations assumed by the lice upon the host such as in the ears and in the deep crevices about the legs. A number of live lice were found upon most of the sprayed hogs a few days following the application of the oil.

One pig which was very heavily infested with hog lice was thrown and sprayed with a six per cent emulsion, care being taken to force the spray into those parts of the animal's body in which it was thought certain lice might escape the oil. In the opinion of the author, this type of application gave a satisfactory control of the lice upon this animal.

It is not possible to estimate the percentage of eggs which are killed by the effects of the oil. In none of the experiments made with the oil in dilutions up to 12 per cent has the oil proved efficient as an ovicide, the nymphs usually appearing between the third and fifth day.

The herd was inspected April 15, about six months after the treatment of Volck, and a few lice were found upon a few animals. Seven lice were found on one pig, two upon another, and none on nine.

Since the herd had been thrown together during the winter months and because several sows and three boars that had been sprayed but once were included with the others, it is felt that the subsequent infestation came from these other animals and not from the hogs within the herd that had been given two treatments of six per cent Volck.

### Hog Mange

**(Sarcoptes scabiei** var. **suis)**

Sixty-eight pigs infested with the mange mite of

swine were divided into three experimental lots and were dipped in Volck oil emulsions of five, ten and twenty per cent.

All the examinations of these animals were made upon those pigs which had been dipped in twenty per cent Volck, the attitude taken being that if a control was effected at this strength, additional checks could be taken upon those pigs which were dipped in emulsions of lesser concentration.

Volck oil in emulsions up to twenty per cent showed no beneficial effects in the control of the mange of hogs in a single application.

### Volck Oil As A Hair Dressing

Volck oil in a five per cent emulsion was brushed into the hair of 20 steers and one heifer which were being conditioned for the show ring. In every case the oil yielded a smooth and shining coat of hair and left the animal in good show condition. In no case were any ill effects noticed which resulted from the use of the oil.

Volck oil in a 50 per cent emulsion to which was added several drops of perfume, has been used by two men for several months, as a hair dressing. The author has used 100 per cent Volck as a hair dressing for nine months. No ill effects have been noticed from the use of the oil, and it is a very satisfactory hair dressing.

### Discussion

The oil is seemingly effective in killing nymphal and adult lice upon domestic animals. In every case where an infested animal was treated with an emulsion of proper strength, most of the parasites were dead within a few hours and usually the remainder were gone the day following. This was quite misleading for all these animals became reinfested later.

When the later infestations were first noticed, it was thought that a few adults had escaped the action of the oil through unsatisfactory application. This was possibly true in a few doses, but subsequent work showed that the oil in percentages of 12 and less did not affect the eggs of the parasite to any great extent.

Two applications of Volck at six per cent used as a dip gave a very satisfactory control of lice. The second application was made after all the eggs of the parasites had hatched, and before the nymphal females became

mature.

No conclusions have been reached as to the effect of Volck oil in the control of mange.

It is probable that the oil will be found to be very effective in most cases where the parasite has no egg stage upon the host. One application in the proper dilution should give almost a complete control. Where the parasite has an egg stage upon the host, it is believed that two applications will be necessary to rid the animal of the parasites.

## Conclusions

1. Volck Oil, Special Emulsion No. 2, in proper dilution is effective in a single application when in contact with those external insect parasites which have no egg stage upon the host.

2. Two applications of Volck oil in proper dilution is necessary to control those external insect parasites of animals when these have an egg stage upon the host.

3. The oil is not effective as an ovicide in dilutions of 12 per cent and less.

4. The oil is harmless to animals when used externally, and is harmless to animals when used internally in doses such as the animal would be subjected in ordinary dipping and spraying.

5. When used as a hair dressing, Volck oil acts favorably upon the skin and hair of animals.

## Acknowledgments

Most of this work was carried on under the direct supervision of Prof. D. A. Wilbur of the Department of Entomology, and Dr. E. J. Frick of the College of Veterinary Medicine. Both have aided me in many ways in carrying out this program. Acknowledgment is also due to Mr. S. M. Carnahan of Stockdale, Kansas, who allowed his entire herd of 265 hogs to be used for louse experiments, and also to Mr. C. M. Bergen of Manhattan, Kansas, who permitted 70 head of hogs to be used for the work on hog mange.

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# AN ANNOTATED LIST OF THE SARCOPHAGINAE WHICH HAVE BEEN COLLECTED IN KANSAS

*By*

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Thirty-eight species of Sarcophaginae have been collected in the State of Kansas to date. This list is based upon opproximately three thousand specimens in the collections of Kansas University, Kansas State Agricultural College, Dr. C. F. Adams, Dr. R. H. Painter, and the author. This material has been determined by Dr. J. M. Aldrich, Dr. R. R. Parker, Mr. H. J. Reinhard, and the author.

The Sarcophaginae of Kansas, as based upon these specimens are not especially peculiar to the region, and the following list is applicable, with minor exceptions, to most of the states in the Great Plains area. Several species which will certainly be found to occur in Kansas. but which are not represented in the collections listed above, are given in an additional list.

The literature on Kansas insects contains a number of names such as **Sarcophaga sarraceniae** Riley, **S. assidua** Walker, and **S. cimbicis** Townsend, these names being based upon specimens which were very probably mis-identified. Records based upon specimens determined before 1916 should be disregarded.

The sub-family Sarcophaginae are very interesting from a biological standpoint. A few species are parasitic beyond all doubt. Several species have been reared from insects and from vertebrates such as turtles, as well as animals and man. Other species are scavengers upon numerous types of refuse, and a few become parasites or scavengers, whichever opportunity presents itself.

Only a few life-histories of Sarcophaginae are known. Characteristically, the female deposits maggots from a V-shaped uterine-like organ upon the source of food. The maggots spend a varying number of days in food supply, several days as pre-pupae, and a relatively longer time as pupae, all depending upon weather conditions. Some individuals in mid-summer are but fifteen days from first-stage maggot to adult. A typical parasitic life cycle in July is, larvae, three days; pre-pupae, two to four days; pupae, ten days. Scavenger larvae usually have a relatively short life cycle during the summer months.

Several of the following species are important grasshopper parasites and have been reared a number of times in Kansas. These species occur regularly in all grasslands in the middle west. Representatives of the group are found in all areas in North and South America which are infested with grasshoppers.

During the past few years, Professors McColloch and Hayes, of the Kansas State Agricultural Experiment Station, have reared a number of parasites of several species of May Beetles (Phyllophaga) occuring in Kansas. Among the flies which have emerged in the parasite cages are several species of **Sarcophaga** which are not generally accepted at the present time as being parasitic.

The technique employed to secure these parasites was to collect the living beetles in the field, placing them in fly-tight rearing cages at the insectary. These cages were inspected daily, emerged material and dead beetles being removed.

Either the Sarcophagids which emerged were parasitic upon the living beetles, or they were scavengers upon dead beetles. All the material placed in the rearing cages was alive at the time of entering. Therefore there was no chance of introducing scavengers at that time. Female Sarcophagids may have dropped maggots through the screenwire upon dead beetles. This is a very faint possibility, for the dead beetles were removed from the cages daily, and several hours must elapse after the beetles are dead before the beetle becomes putrified enough to become an attrahent to female Sarcophagids. This time varies with the temperature and humidity, but it hardly seems probable that a dead beetle would be blown before twenty-four hours. For these reasons, it is felt that the species are true parasites upon the species of Phyllophaga concerned.

I gratefully acknowledge the aid given me by the Entomological Departments of Kansas State Agricultural College and Kansas University. I am especially indebted to Professor J. W. McColloch who turned over to me all his rearing records of Sarcophagid parasites of May Beetles.

Although a bibliography is given, Dr. J. M. Aldrich's Sarcophaga and Allies, 1916, contains practically all the species here listed. A description and a figure of the male genitalia is given in that publication for the species then known to occur in North America.

## FAMILY **CALLIPHORIDAE**
### Subfamily **Sarcophaginae**

1. **Sarcophaga aculeata** Aldrich. (1)*
Riley Co., Aug. 13, (Dean); Harper Co., 1417 ft., (Beamer). This species has been reared as a parasite of grasshoppers, a number having been reared in Kansas by Dr. E. G. Kelly.
2. **Sarcophaga aculeata** var. **gavia** Aldrich. (1)
Harper Co., 1417 ft., (Beamer).
3. **Sarcophaga aculeata** var. **taediosa** Aldrich. (1)
Riley Co., June 19. The specimen which was determined as this variety was taken from the nest of a **Bembix** sp. where it had been stored by the wasp.
4. **Sarcophaga alchedo** Aldrich. (1)
Rawlins Co., 2850 ft., August. 13, (Williams); Douglas Co., July.
5. **Sarcophaga assidua** Walker. (2)
One of the most common Sarcophagids occurring in Kansas, and often reared from various kinds of excrement. It is usually collected during the months from May to October.
6. **Sarcophaga bullata** Parker. (3)
This species is commonly reared from decaying fish and meat, and is collected from May to October.
7. **Sarcophaga caridei** Brethes. (4)
McPherson Co., Reno Co., Medora Sand Dunes, September 22, (Painter and Hall). Although the species does not appear to be common in this state, it is taken very commonly throughout the south and in South America, where it is a well known grasshopper parasite.
8. **Sarcophaga cimbicis** Townsend. (7)
Common over the entire state. Professor McColloch's records show that it is a parasite of **Phyllophaga futilis, lanceolata, implicita, rugosa, crassissima,** and **Ligyrus gibbosa.** It is also recorded as having been reared form **Cimbex americana.**
9. **Sarcophaga cistudinis** Aldrich. (1)
McPherson Co., June 26, (Beamer); Chautauqua Co., 841 ft., (Beamer). It is usually accepted that this species is a parasite of the Box

*Figures in parentheses refer to bibliography.

Turtle (**Cistudo**).

10. **Sarcophaga cooleyi** Parker. (3)
Leavenworth Co., June 27 (Beamer).

11. **Sarcophaga eleodis** Aldrich. (1)
Osage Co., June 15, (Brown); Sherman Co., September 4, (Painter). This species has been reared a number of times as a parasite of **Eleodes**. It seems to be more common farther west.

12. **Sarcophaga falcoformis** Aldrich. (1)
Finney Co., Nov. 15.

13. **Sarcophaga falculata** Pandelle. (5)
Riley Co., reared from decaying meat. (Ackert).

14. **Sarcophaga galeata** Aldrich. (1)
Montgomery Co., 798 ft., (Beamer). This species is a member of the **S. assidua** group, all of which, so far as is known, are excrement feeding forms.

15. **Sarcophaga haemorrhoidalis** Fallen. (6)
Delphos, Ottawa Co., June; Riley Co., June 24, (McColloch and Hayes); Franklin Co., June 6; Harper Co., 1417 ft.; Scott Co., Apr. 22, (Beamer). This is a most common cosmopolitan species that is almost world wide in distribution. It is often reared in excrement, and decaying meat.

16. **Sarcophaga helicis** Townsend. (7)
Probably no species of Sarcophaga has a wider distribution in the United States than **S. helicis**. It has been reared many times as a scavenger, and also a parasite. Professor McColloch's records show that it has been reared from **Phyllophaga lanceolata, futilis,** and **crassissima**... It may be taken in Kansas from April to November.

17. **Sarcophaga hunteri** Hough. (8)
This species is taken over the entire state of Kansas, from June to September. It is commonly reared as a grasshopper parasite.

18. **Sarcophaga impar** Aldrich. (1)
Douglas Co., 900 ft., (Snow); Scott Co., June 17, Franklin Co., June 8, (Beamer); Douglas Co., July 11, (Hoffman); Riley Co., July 24, (Popenoe); Riley Co., July 17, (McColloch and Hayes). The species has been reared from grasshoppers, and several kinds of refuse. Pro-

fessor McColloch's records show that it has been reared from adult **Phyllophaga lanceolata.**

19. **Sarcophaga kellyi** Aldrich. (1)
Numerous specimens in the Kansas collections show that this species is common all over the state. Many of the specimens have been reared as parasites of grasshoppers. It seems that the species becomes common late in the fall, most specimens being taken in September, although several specimens were taken in August, and a few as late as November.

20. **Sarcophaga latisetosa** Parker. (3)
Atchison Co., July 24, (Breakey). Only two specimens of this species are represented in the collections seen by the author. While it is true that the species seems to be more generally found north and east of this state, it is felt that future collecting will show it to be quite numerous in Kansas. It has been reared as a scavenger in human excrement.

21. **Sarcophaga latisterna** Parker. (3)
Montgomery Co., 798 ft., (Beamer). It has been bred from **Pontia rapae** in Maryland.

22. **Sarcophaga marginata** Aldrich. (1)
Seward Co., 2600 ft., Aug. 18, (Williams).

23. **Sarcophaga opifera** Coquillett. (9)
This species is another of the very common grasshopper parasites which are collected generally over the entire state of Kansas. It is found during the months of June, July and August.

24. **Sarcophaga pachyprocta** Parker. (3)
Douglas Co., Aug. 24, (Williams); Douglas Co., July, (Kellogg); Douglas Co., (Snow); Gove Co., 2813 ft., (Williams); Riley Co., Apr. (Marlatt); Riley Co., Apr. (Painter).

25. **Sarcophaga pallinervis** Thomson. (10)
Of the excrement feeding Sarcophagids, this species is the most commonly reared. It is very common in Kansas, and may be collected from May to October.

26. **Sarcophaga planifrons** Aldrich. (1)
Because of its close similarity to **S. pallinervis,** it might be surmised that this species is also an excrement feeding Scarcophagid. No records of its ever having been reared have been seen. It is very common in Kansas from April to August,

and has been collected over most of the state.

27. **Sarcophaga plinthopyga** Wied. (11)
Seward Co., 2600 ft., Aug. 18; Morton Co., 2600 ft., Aug., (Williams). This species is not taken often in Kansas, although a few specimens have been found in the western part of the state.

28. **Sarcophaga prohibita** Aldrich. (1)
A number of specimens of this species have been reared by Professors McColloch and Hayes as parasites of **Phylloghaga.** In the case of this species, they observed the females darting at the flying adult beetles, which when collected afterwards, had small white larvae upon their elytra. This habit of oviposition has also been observed in **S. kellyi, S. hunteri and S. opifera,** all of which are parasites of grasshoppers. The species does not seem to be abundant in Kansas, the specimens seen being collected during the months of July and August.

29. **Sarcophaga quadrisetosa** Parker. (3)
This is a commonly collected excrement feeding form taken from June to September, over the entire state.

30. **Sarcophaga reversa** Aldrich. (1)
Riley Co., July; Stafford Co., Salt Marsh. April 30, (Painter).

31. **Sarcophaga sarraceniodes** Aldrich. (1)
Very common over the eastern part of Kansas, although it is taken quite commonly in the western part of the state. It has been reared as a parasite of grasshoppers, many times, as well as a number of other insects. Other specimens have been reared as scavengers from carcasses and decaying meat. Professors McColloch and Hayes record several as being reared from **Phyllophaga lanceolata, futilis, rugosa and crassissima.** The species seems to be most common during the month of July, although specimens have been taken from June to October.

32. **Sarcophaga sima** Aldrich. (1)
Montgomery Co., 798 ft., (Beamer).

33. **Sarcophaga sinuata**
Miami Co., Leavenworth Co., July 7, (Beamer); Atchison Co., July 9, (Breakey). Professors McColloch and Hayes have reared this species as a parasite of **Phyllophaga rugosa.**

34. **Sarcophaga sulculata** Aldrich. (1)
Riley Co., reared from decaying meat (Ackert).

35. **Sarcophaga spatulata** Aldrich. (1)
McPherson Co., Reno Co., Medora Sand Dunes, September 27, (Painter and Hall); Riley Co., September 12, (Hall). This species has been taken in company with a number of Miltograminids which were following several fossorial wasps into their nests in sand. It could not be ascertained whether or not larvae were deposited upon the insects which were carried into the burrows by the wasps. The author believes that although actual proof is lacking, it will be found this species has the same type of life-cycle, in regard to depositing maggots upon the food of immature fossorial wasps, as do the **Miltogrammini.**

36. **Sarcophaga utilis** Aldrich. (1)
Taken generally over the state. It is usually most common during months of July and August. This species has been reared from **Phyllophaga futilis lanceolata** and **crassissima** by Professors McColloch and Hayes. One specimen, No. 4040, reared from **Phyllophaga futitis,** had the following life cycle: Larva, June 12; pupa, June 16; adult, August 3.

37. **Emblemasoma erro** Aldrich. (1)
Russell Co., July 26, 1830 ft., (Williams); Comanche Co., 2089 ft., (Beamer); Pottawatomie Co., (Crevecoeur).

38. **Pachygraphia unicolor** Aldrich. (1)
Osborne Co., Riley Co., May 15, (Painter and Hall).

The following list of twenty-one species have been determined by the author from states surrounding Kansas. It is felt that these species will be found to occur in this state with future more intensive collecting.

1. **Sarcophaga atlantis** Aldrich.
2. **Sarcophaga bisetosa** Parker.
3. **Sarcophaga cingaris** Aldrich.
4. **Sarcophaga flavipalpus** Aldrich.
5. **Sarcophaga marginata** Aldrich.
6. **Sarcophaga melampyga** Aldrich.
7. **Sarcophaga misera,** var. **exuberans** Pandelle.
8. **Sarcophaga misera,** var. **harpax** Pandelle.

9. **Sarcophaga ochracea** Aldrich.
10. **Sarcophaga peniculata** Parker.
11. **Sarcophaga rudis** Aldrich.
12. **Sarcophaga salva** Aldrich.
13. **Sarcophaga scoparia** Pandelle.
14. **Sarcophaga setigera** Aldrich.
15. **Sarcophaga servilis** Aldrich.
16. **Agria affinis** Fallen.
17. **Amobia aurata** Coquillett.
18. **Brachycoma devia** Fallen.
19. **Hypopelta scrofa** Aldrich.
20. **Sarcofahrtia ravinia** Parker.
21. **Wohlfahrtia miegenii** Schiner.

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## ENTOMOLOGY IN KANSAS*
### A Historical Note

*By*

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In history or story "beginnings" and "good old days" hold interest for the present. They serve to show the distance traveled, the progress made, and by provid-

* Contribution No. 87, Department of Horticulture.

ing a background complete the picture of the period or science under study. Today in Kansas, entomology occupies an enviable position through the world-wide fame of entomologists at both the Agricultural College and the University. Yesterday, the science was still in the stage of empiricism, tradition, and superstition.

This view was recently presented to the author when he had an opportunity to look through the minutes book kept for nearly ten years by the secretary of the Manhattan Horticultural Society. This society was organized in January, 1874 and met with considerable regularity until February 1884, when the last entry in this record was made. Many men of interest, including the first three professors of horticulture at the college, Gale, Van Deman, and Popenoe, were members of the society and frequently took part in the discussions.

When it is remembered that 1874 was "grasshopper year" in Kansas it will cause no surprise to learn that the "Hateful Locust" was the first insect mentioned in the meetings. Under date of March 25, 1875 Professor Gale was requested to prepare an essay on the grasshopper but he seems to have failed to keep his assignment as his main interest was forestry. However, on June 15 of the same year this entry occurs. "The subject for discussion (the grasshopper) was introduced by Mr. Thomas Wells who read a carefully prepared paper on the history and habits of this insect. It is especially valuable as it gives an authentic account of the number and extent of the grasshopper visitations in this locality for the past twenty years. The author consented to its publication in the Nationalist next week." The record continues, "All agreed that the disasters of last year were due to an unusual combination of circumstances. The long drouth, the grasshoppers, and the intense cold of the winter all combined have killed most of the peach trees."

That Missouri suffered from the grasshopper is shown by an entry in the minutes of August 19, 1875. "After partaking of a bountiful collation prepared under the efficient superintendence of Mrs. Todd, Professor Lee who had just returned from an extended trip in Missouri, reported that he was better than ever satisfied with this section of the country as he found sad devastation from grasshoppers and excess of rain in Missouri."

Two years later a nameless authority is quoted as stating that worms, damp weather and cold cause peach leaf curl but that, fortunately, the same climatic excesses have greatly diminished the numbers of maple worms and chinch bugs. To the query, "Are other countries afflicted as we are with insects?" a case is cited in which "The R. R. trains near London, Canada, were stopped recently by caterpillars; the Colorado potato bug is worse in the east than here; New Jersey and Connecticut swarm with 17 year locusts; and ten inches of rain (not insects) fell recently in one day in Rhode Island. Happy Kansas!"

The Kansas State Horticultural Society met in Manhattan December 13, 1875, and had as visiting scientists Prof. C. V. Riley, state entomologist of Missouri and Prof. F. H. Snow of the University of Kansas. Professor Riley in his talk referred to the Rocky Mountain, or hateful, grasshopper outbreak of the previous year, but thought they would not come again for several years and might not ever come again. He was more interested in spring and fall canker worms, the plum gouger, and the curculio. He had evidently made a careful study of the morphology and life history of these insects. No adequate method of control was given for these pests, though bandages about the trunks of fruit trees were thought to be of some value. He also presented a set of resolutions to Kansas congressmen, praying the government to undertake the control of the Rocky Mountain grasshopper. It outlines plans which remind one of the corn borer and Mediterranean fruit fly programs.

Professor Snow was even then placing the annual crop destruction in the United States due to insects at $500,000,000. "The total amount annually expended for the repression of insect foes by congress and all our state legislatures combined does not exceed $10,000." he adds. Seven "public" methods of repression are listed. They are—Compel every man to keep his own grounds free from insects, pay bounties for insects collected, introduce parasites from the homes of introduced insects, employ state entomologists (three then had them), protect insectivorous birds, appoint a national commission on insect calamities, and educate the people about insects. The remainder of Professor Snow's talk was an elaboration of the last item in his list. He thought entomology should be taught in the public schools.

Other insects in addition to those mentioned claimed the interest of these early Manhattan fruit growers and destroyed their trees or their crops. The tree cricket was doing great damage to grape vines and fruit trees in 1879 and Prof. E. A. Popenoe inquired whether any of the growers had devised a way to prevent it. No one had. The twig pruner was also mentioned as doing damage.

Through the whole decade complaints were recorded against the fruit tree borers, especially the flat headed apple tree borer. Washes as a means for their control were condemned as valueless, and capturing the adult beetle was recommended. Paying children one cent each for all beetles brought in was considered the best practice. Catches of 1,000 and 1,200 beetles by individual boys are recorded and indicate that the borers must have been numerous. It was not until 1883 that the vigor of the tree and attacks by flat headed borers were correlated. Mr. T. C. Wells of the society explained this relation.

It was also in 1883 that first reference to the codling moth was made. The record is, "Professor Platt asked for a remedy for codling moth." "Professor Popenoe said that Professor Cook of Michigan Agricultural College used London purple, sprinkling the trees with water in which this material was mixed, one spoonful to the barrel. Paris green was also used." At this time also the members were trying to determine what insect was the cause of fire blight, but a little later Professor Popenoe explained to them the real cause.

The reader of these old records, provided he is in touch with present day achievements by entomologists, wonders how the pioneer ever grew any fruit. It is of interest too, that despite the progress made, many entomological problems of the decade studied still remain unsolved and that many of the oldtimers were on the track which later led to efficient control of other insects.

## PROCEEDINGS OF THE KANSAS ENTOMOLOGICAL SOCIETY

### Minutes of the Fifth Annual Meeting

President P. M. Gilmer called the meeting to order at 9:10 a. m. on April 27, 1929, in room 53, Fairchild

Hall, Kansas State Agricultural College, Manhattan, Kansas, as an affiliated society of the Kansas Academy of Science. The minutes of the fourth annual meeting of the society were read by the secretary and approved.

The report of the treasurer for the year ending Dec. 31, 1928, was read and accepted. There are 145 subscribers to Vol. I of the Journal of the Kansas Entomological Society to date. The presidential address was carried over to the afternoon meeting.

President Gilmer next appointed the resolutions and nominations committees.

Resolutions Committee: W. Knaus, Ch., Kathleen Doering, and R. H. Painter.

Nominations Committee: J. W. McColloch, Ch., P. B. Lawson, and H. J. Grady.

Reports of standing committees.

Publication Committee: P. B. Lawson, Ch.; J. W. McColloch, Ed.; Hazel E. Branch, H. H. Ninninger, and W. Knaus.

Chairman P. B. Lawson praised the work of the editor, J. W. McColloch; the publisher, W. Knaus, and the Secretary-Treasurer, R. L. Parker, in the establishment of the Journal of the Kansas Entomological Society. Editor McColloch reviewed the policy of the Journal as printed on p. 2 of Vol. I. He explained the diversion from the policy. He spoke for the committee in regard to the expansion policy. Since there is no entomological journal published in the Middle West east of the Rocky Mountains and west of the Appalachian Mountains, papers would be received from those interested in this science in the region between the Mississippi River and the Pacific Coast states. It is hoped that the officials of the Rocky Mountain Conference of Entomologists will make this journal the official organ of the conference. With an added subscription list, the size and scope of the journal can be easily increased to a larger number of pages to each number, or by more numbers per volume. Report accepted. Committee continued.

The committee on check list of Kansas insects,
W. Knaus, Ch., and J. W. McColloch.

J. W. McColloch reported that the present published list and other papers in view will make the list about 1000 species Report accepted. Committee continued.

The committee on the Society insignia,
R. L. Parker, Ch., Kathleen Doering and P. M. Gil-

mer had four sketches submitted to the committee and these were pesented to the Society for action. A motion was made that the matter be referred to the committee with power to act and have it ready for publication in Vol. III, No. 1, on Jan. 1, 1930. The motion was carried. The committee met and made a selection of insignia. This committee has passed on its action to the chairman of the publication committee. The insignia is a sunflower three inches in diameter with a blank center of 1¾ inches for the insertion of a seal or a photograph. A ring or border of shading surrounds the area for the seal. This is one-eighth inch wide. The petals of the sunflower which arise from the shaded ring are one-half inch long. It is suggested that this design be placed upon a jacket, or outer cover. Committee discharged with thanks.

The matter of membership dues was brought before the Society. Several suggestions were made, but none received any favorable action. The principal thing which was brought out in the discussion was that the subscription price of the Journal should not be increased to $1.50. Motion made that the assessment of the extra 50 cent dues as called for in the constitution be taken when necessary by action of the Society. Motion carried.

A motion was made that the publication committee of the Kansas Entomological Society be given the first option on the publication of any article presented before a meeting of the Society. Motion carried.

New Business.

The reports of special committees were heard at this time.

A motion was made that R. L. Parker be the representative of the Society on the Executive Council of the Kansas Academy of Science. Motion carried.

Report of the Resolution Committee:

We, the committee on resolutions, beg leave to present the following: In behalf of the Kansas Entomological Society, we wish to congratulate the publication committee on the successful launching and material growth of the subscription list of the Journal of the Kans. Ent. Soc. on closing it first year and half of its second year with a satisfactory subscription list and good balance in the treasury. We as members of the society pledge ourselves to do everything that we reasonably can to improve this publication in the future in the way of individual support and entomological contributions

so that the publication will be recognized as one of the leading entomological publications of the United States. Resolutions accepted and committee discharged with thanks.

The nominations committee reported the following names for officers of the year 1929-1930:

President—H. B. Hungerford
Vice-Pres.—J. R. Horton
Sec.-Treas.—R. L. Parker

Motion was made that a vote be cast by the secretary, electing the above officers for the ensuing year. They were so voted into office .

A motion was made that the place of meeting in 1930 be selected by the executive committee. Motion was carried.

The following papers were presented in the afternoon session:

Presidential address—Orchard Heterogeneity in Codling Moth Work. - - - - - - - - P. M. Gilmer.
2. Scolops osborni Ball in Kansas. - - R. H. Beamer
3. Some Leafhopper Problems. - - P. B. Lawson
4. The Sarcophaginae of Kansas - David G. Hall
5. Some Observations of Triphleps insidiosis Say - - - - - - - - - - - G. Edw. Marshall
6. A Review of the Bombyliid Genus, Heterostylum. - - - - - - - - - - - R. H. Painter
7. The Genus **Agrilus** of Kansas (Buprestidae) - - - - - - - - - - W. Knaus
8. Here and There in European Museums in Quest of Types. (Illustrated) - - H. B. Hungerford

Twenty-five members and friends were in attendance.

Adjournment. R. L. Parker, Secretary.

## FIELD MEETING AT THE MEDORA SAND DUNES

A meeting of the Kansas Entomological Society was held on July 3rd and 4th, 1929, at the collecting ground on the sand dunes in the vicinity of Medora, Reno County, Kansas. Everyone present participated in night collecting on the third. Fair day collecting was had on the fourth. The following made the trip from Manhattan and McPherson: S. A. Summerland, G. E. Marshall, W. A. Horsfall, F. W. Walker, Mr. and Mrs. H. K. Gloyd, Mr. and Mrs. R. H. Painter, C. A. Scott, W. Knaus, R. L. Parker, S. G. Kelly, and D. A. Wilbur.

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# Journal

OF THE

# Kansas Entomological Society

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